Proposed Title for Ph.D. Research Work

Determination of suitability of *Acacia auriculiformis* fruit as a piscicide of choice and evaluation of its efficacy

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Date of Admission in Ph.D.

10.03.2016

Introduction:

Fish flesh is the best source of animal protein due to the low level of connective tissue that makes it more digestible than other animal protein source (Agbon et al, 2002). But there are a number of factors militating against the development of culture fisheries. One of them is the weed fish, which compete and sometime predate on the fry and fingerlings of stocked fish culture (Pillai et al, 2010). Fish toxicant is used for many purposes like to prevent overpopulation in cultured pond, to prevent the overlapping of niches in composite fish culture, to eradicate the predatory fishes in the time of pond preparation, in fishing purpose or used to rid poisonous fishes or dangerous fishes such as piranha in many countries. Some criteria are needed to be a popular toxicant are- it will be available and of low price, it will become harmless at short time period and small amount will be needed to eradicate (Ayotunde et al, 2011).

Present status of toxicants application in fishery:

Several plants are known to have their piscicidal activity. Twig and stem of mangrove plant *Aegiceras corniculatum* demonstrate toxicity to fish (*Tilapia niloticus*). 5-O-Methylembelin is the component of the plant used in 1ppm concentration to kill fish within a period of 75 minutes (Gomez et al, 1999). Smartwood (*Polygonum hydropiper*) is used as a fish toxicant in karbi-analong district of Assam. It causes dermatitis, irritation and smarting when come in contact with the eyes or nostrils of the animals. But the fish die mainly due to depletion in dissolved oxygen (Kalita et al, 2009). It has been reported that rotenone is used in huge amount in Canada and North America. The LC_{50} of rotenone was estimated 5 µg to 100 µg / l in different fishes. The toxicity persists from few days to several weeks. It blocks mitochondrial electron transport by inhibiting NADH-ubiquinone reductas. Rotenone is rapidly absorbed by gill epithelium and distributed in tissue where it bocks oxygen use by cell (Gilderhus, 2011). Tea seed cake contains 5 % to 7 % saponin and is also known to use as an effective toxicant for fish. It causes hepatic and kidney tissue degradation, vacuolization, necrosis, haemolysis (Ramanujan and Ratha, 2011). Mahua oil cake is a widely used fish toxicant. It is a derivative of the plant *Brassica latifolia*, used as fish toxicant cum manure in nursery and rearing pond management for composite fish culture (Jana and Pal, 1983). Haemolytic effect of mahua oil cake has been reported (Jana et al, 1987). It contains 4.6 % saponin which causes complete shrinkage of erythrocytes, haemolysis and reduction in level of haemoglobin followed by fish mortality

(Bhatia, 1970). A dose of 200 to 250 ppm is recommended for complete eradication of predatory fishes from the water body (CIFRI, 1968). It is comparatively larger dose in comparison to other plant origin substances put on trial. Presently, the cost of it is hiked for its potential use as an ingredient in feed formulation of fish and other animals. In view of that a better substitute of mohua oil cake is required to be searched considering the efficacy, availability and biodegradability (Chakraborty, 1987). The proposed plan of work is thus aimed towards selection of an alternative suitable piscicide of botanical origin

Rationale for selection of the plant toxin:

Acacia auriculiformis is widely being using for aforestation and as avenue tree plantation. It produce large amount of fruits which are not effectively used for beneficial purposes. The fruit pod contains different secondary metabolite of which triterpinoid saponins are the principal components. The plant is known for its pharmacological properties notably anti-helminthic, antifilarial, microbicidal activity. The plant is also a major source of paper pulp, fuel wood and timber. It can thrive not only in poor soils but is also adapted well to areas with extended dry seasons. The fruits of this tree are sufficiently available and are rich source of triterpinoid saponins especially, Acaciaside-A (Ac-A) and Acaciaside-B (Ac-B). Earlier investigations have demonstrated that Ac-B isolate from seed extracts of *A. auriculiformis* possess spermicidal activity (anti-fertility) even at significantly lower concentrations (Pakrashi et al., 1991; Pal et al., 2009). Keeping this in mind, efficacy of *A. auriculiformis* pod could be evaluated as a promising fish toxicant.

Objective of work:

1. Determination of dose: Lethal concentration of *A. auriculiformis* pericarp preparation will be worked out on different predator fishes of freshwater to recommend a suitable dose for pond management.
2. Evaluation of mode of action of the toxicant: Following parameters will be studied to evaluate the mode of action of the toxicant in fish system
    a. Evaluation of its efficacy on respiratory surface with the aid of light as well as electron microscopy.

b. Haematological evaluation of the fish under exposure to different experimental doses of the toxin.
c. In corroboration with the haematological studies haematopoitic efficiency of the fish will be evaluated under treatment.
d. Erythropoietin (EPO) is the key hormone that regulates the dynamics of erythropoiesis. Under this toxicity stress thus EPO level will be monitored by Enzyme linked immunosorbant assay.

3. A field trial will be conducted to determine the dose for field condition.
4. Nutrient content of exposed fish will be measured to understand the suitability of its consumption.
5. Natural degradation of the plant derivative substance and its manure potency will be estimated.
6. Determination of the hydrological and soil parameters (dissolved oxygen, water hardness,)
7. Suitability of use of different aged fruit according the amount of saponin present in it.

Expected outcome of proposed research work:

The proposed work will help us to:

a. Determine the lethal dose for field application as a piscicide.

b. Underscore the mechanism of action of the plant toxin derived from *A. auriculoformis.*

c. Understand environmental suitabilities of its application.

d. Establish *A. auriculoformis* as a substitute of mahua oil cake.

Key Words:

Piscicide, Haematopoiesis, Erythropoietin, Saponin, Toxicant

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